

REMARKS

Applicants are amending their claims in order to further clarify the definition of various aspects of the present invention. Specifically, Applicants are amending claim 1 to delete recitation that the polymer B has an atomic group capable of forming an intermolecular hydrogen bond "in a molecular skeleton" of the polymer molecule; and have further amended claim 1 to recite that the at least one nitrogen atom, contained in the vinylic polymer and/or copolymer of the polymer B, is contained in an amino group, an amide group, or a group consisting of a pyridine unit. Claims 2 and 3 have been similarly amended. With respect to the description of the at least one nitrogen atom, note, for example, page 18, line 14-22, of Applicants' Substitute Specification submitted with the Response filed October 27, 2004, in the above-identified application. Applicants have amended claims 4, 7, 12, 15, 16 and 19 to be in independent form, deleting from these independent claims 4, 7, 12, 15, 16 and 19 that the polymer B has an atomic group capable of forming an intermolecular hydrogen bond "in a molecular skeleton" of the polymer molecule; and wherein claim 12 does not include amounts of the specified monomer as in previously considered claim 2.

In addition, Applicants have amended claims 4, 12 and 16 to delete from these claims the second recitation of a specific acrylate and methacrylate.

Initially, it is respectfully requested that the present amendments be entered. Noting, for example, previous arguments made in the above-identified application, and also noting page 18, lines 14-22, of Applicants' Substitute Specification, it is respectfully submitted that the present amendments clearly do not raise any new issues, including any issue of new matter. Noting especially the rejection under the second paragraph of 35 U.S.C. §112, and the present claim amendments, as well as

clarification of the present invention as in the amendments to the present claims, it is respectfully submitted that the present amendments materially limit issues remaining in connection with the above-identified application; and, at the very least, present the claims in better form for appeal. Noting the new reference applied by the Examiner in the Office Action mailed August 31, 2006 as well as the clarification therein of the basis for rejection of claims under the second paragraph of 35 U.S.C. §112, it is respectfully submitted that the present amendments are clearly timely.

In view of the foregoing, it is respectfully submitted that Applicants' have made the necessary showing under 37 C.F.R. §1.116(b)(3); and that, accordingly, entry of the present amendments is clearly proper.

Applicants respectfully traverse the rejection of their claims under the second paragraph of 35 U.S.C. §112, as being indefinite, particularly insofar as this rejection if applicable to the claims as presently amended.

Thus, in the paragraph bridging pages 2 and 3 of the Office Action mailed August 31, 2006, the Examiner contends that claims are indefinite in that it is unclear how the nitrogen atom in the molecular side chain alone "can afford intermolecular hydrogen bond in the molecular side chain and/or in a molecular skeleton", the Examiner stating that such nitrogen atoms in the side chain "can at best result in intermolecular hydrogen bond in the molecular side chain only and not in the molecular skeleton." Applicants have amended claims 1-3 to delete recitation that the polymer B has an atomic group capable of forming an intermolecular hydrogen bond in a molecular skeleton of the polymer molecular, stating that such polymer B has such atomic group capable of forming an intermolecular hydrogen bond in a molecular side chain of the polymer molecular; and have further amended the definition of polymer B in reciting that such polymer is a vinylic polymer and/or

copolymer having at one nitrogen atom contained in a specified group "in a molecular side chain", deleting recitation that such at least one nitrogen atom is contained in a molecular skeleton. Independent 4, 7, 12, 15, 16 and 19 include corresponding recitations as in presently amended claims 1-3, omitting recitation of Polymer B having the recited groups "in a molecular skeleton". In view of amendments to claims 1-3, as well as in light of amendments to now independent claims 4, 7, 12, 15, 16 and 19, it is respectfully submitted that the rejection of claims under the second paragraph of 35 U.S.C. §112 as being indefinite, is moot.

Applicants respectfully submit that all of the claims presented for consideration by the Examiner patentably distinguish over the teachings of the prior art applied by the Examiner in rejecting claims in the Office Action mailed August 31, 2006, that is, the teachings of U.S. Patent No. 5,612,417 to Rhein, et al, under the provisions of 35 U.S.C. §102 and 35 U.S.C. §103.

Initially, it is noted that the Examiner has only rejected claims 1-3, 5, 6, 8, 9, 11, 13, 14, 17 and 18 on prior art grounds, in Items 5 and 7 on pages 3 and 4 of the Office Action mailed August 31, 2006. Noting present amendments to the claims in light of the rejection under the second paragraph of 35 U.S.C. §112, and also noting that the Examiner did not reject claims 4, 7, 10, 12, 15, 16 and 19 on prior art grounds, it is respectfully submitted that these claims 4, 7, 10, 12, 15, 16 and 19 as presently in the application should clearly be allowed.

With respect to the claims rejected on prior art grounds, it is respectfully submitted that the references as applied by the Examiner would have neither taught nor would have suggested such optical element as in the present claims, including wherein the molding material is a pseudo cross-link resin composition including at least two polymers, the composition being obtained by mixing polymers A and B,

wherein when the polymer and A and the polymer B are mixed together the intermolecular hydrogen bond is formed therebetween, and wherein the polymer A is a vinylic polymer and/or copolymer that has a carboxyl group in a molecular side chain and/or at a molecular tail end, and the polymer B is a vinylic polymer and/or copolymer having at least one nitrogen atom contained in an amino group, an amide group or a group consisting of a pyridine unit, in a molecular side chain, with amounts of monomers containing a carboxyl group forming the polymer A and of a monomer having a nitrogen atom forming the polymer B being amounts as set forth in claims 1-3.

Furthermore, it is respectfully submitted that the reference as applied by the Examiner would have neither taught nor would have suggested such an optical element as in the present claims, including features as discussed previously in connection with claims 1-3, and, additionally, wherein the element is formed by molding a film (see claim 2) or a sheet (see claim 3) obtained from the specified pseudo cross-link resin composition.

In addition, it is respectfully submitted that the applied reference would have neither taught nor would have suggested such optical element as in the present claims, having features as discussed previously in connection with claims 1-3, and, furthermore, including (but not limited to) wherein the monomer containing the carboxyl group is acrylic or methacrylic acid (see claims 5, 13 and 17); and/or wherein total light transmittance and absolute value of refractive index of the optical element is that set forth in claims 6, 14 and 18; and/or molecular weights of the polymer A and polymer B as in claim 8; and/or further recitation of amount of monomer containing the carboxyl group and monomer having the nitrogen atom as set forth in claim 9; and/or mixing ratio of polymer A and polymer B as in claim 11.

The present invention is directed to an optical element formed using pseudo cross-link polymers.

As described in the paragraph bridging pages 4 and 5 of Applicants' Substitute Specification, thermosetting resins, which are generally insoluble and infusible cured materials, are particularly excellent in solvent resistance or durability such as strength maintenance rate or the like under high temperatures. However, since cross-links are formed through covalent bonds, there is a problem in that the thermosetting resins cannot be reproduced.

As a material closest to thermosetting resins that can be recycled, ionomer resins can be cited. In the ionomer resin, a metal oxide or metal hydroxide such as magnesium oxide or calcium hydroxide is added to a polymer having a carboxyl group in its side chain. By forming an ionic bond between the metal and the carboxyl group, a pseudo cross-link point is formed. However, because a bonding force between the metal compound and the carboxyl group is weak, due to factors such as small solubility of the metal compound in the resin, only a slight amount of the metal compound can be added, so that a larger improvement in characteristics cannot be obtained.

In addition, it is desired to provide a material of optical elements, which has not only heat resistance and good mechanical strength, but is also flexible (has improved folding properties).

Against this background, Applicants provide an optical element formed by molding a material obtained from a pseudo cross-link composition including at least two polymers, achieved by mixing polymers A and B of a specified nature, in specified amounts, wherein intermolecular hydrogen bonds are formed between the polymer A and polymer B (or copolymers thereof) when mixed together, which

achieves a product having the desired heat resistance and mechanical strength, yet also having desired flexibility (improved folding properties). It is emphasized that according to the present invention, the intermolecular hydrogen bond is formed between the polymer A and the polymer B or copolymers thereof, due, for example, to amounts of components (e.g., monomers) of the polymer A and polymer B, or copolymers thereof, having the carboxyl group and nitrogen atom forming the intermolecular hydrogen bond therebetween.

By forming the pseudo cross-link as recited in the present claims, the presently claimed invention has improved flexibility (folding properties). As to what is meant by the pseudo cross-linking, note the paragraph bridging pages 20 and 21 of Applicants' Substitute Specification.

Moreover, it is emphasized that according to the present invention, the pseudo cross-link resin composition can be endowed with heat resistance and flexibility. Note, for example, pages 21 and 22 of Applicants' Substitute Specification.

Rhein, et al, discloses thermoplastic molding materials having dimensional stability under heat, and stress cracking resistance, and exhibiting a high degree of transparency, the molding material having components which are compatible with one another and have a high degree of thermal dimensional stability, and comprising copolymers B including monomer units derived from:

(p1): from 30-70 wt % of styrene, α -methylstyrene or a mixture thereof;

(p2): from 29-70 wt % of (C₁ - C₆ - alkyl) methacrylate; and

(p3): from 1-20 wt % of acrylic acid, methacrylic acid, or a mixture thereof,

wherein the sum of (p1), (p2) and (p3) totals 100 wt % of the copolymer P;

and

99-1 wt % of a polymethylmethacrylate polymer PM, comprising monomer units derived from

(pm1): from 80-100 wt % of methylmethacrylate, and

(pm2): from 0-20 wt % of monomers copolymerizable with methylmethacrylate,

wherein P and PM are completely compatible in any weight ratio to form transparent thermoplastic molding materials. See column 2, lines 29-47. Note also, column 2, lines 52 and 53; column 3, lines 18-22; and column 4, lines 42-45. This patent discloses that the molding materials can be produced by mixing copolymers P and polymers PM, wherein any type of process capable of intimate mixing of P and PM can be employed. See column 4, lines 12-15.

It is respectfully submitted that Rheim, et al, does not disclose, nor would have suggested, an optical element including the molding material which is a pseudo cross-link resin composition, such pseudo cross-link being defined in Applicants' Substitute Specification as discussed previously; or other features of the present invention as in the present claims, including, inter alia wherein when the polymer A and polymer B or copolymers thereof are mixed together, the intermolecular hydrogen bond is formed therebetween (the claims reciting that the polymers/copolymers are mixed together), and advantages of the present invention in light thereof.

In this regard, the contention by the Examiner in the third full paragraph on page 3 of the Office Action mailed August 31, 2006, that in Rhein, et al, the polar carboxylic acid groups on one polymer P are inherently capable of interacting with the polar nitrile groups of PM through intermolecular hydrogen bonding thus producing pseudo cross-linked resin is respectfully traversed. In this regard, it is

emphasized that the present claims do not recite an "inherent capability"; rather, the claims recite that the optical element is formed by molding a molding material, the molding material being a pseudo cross-link resin composition. Contrary thereto, it is respectfully submitted that the thermoplastic molding materials in Rhein, et al, do not form a pseudo cross-link between the copolymer P and polymethacrylate PM. Moreover, it is respectfully submitted that Rhein, et al, does not relate to flexibility (folding properties), and does not disclose a composition improving folding properties achieved by the present invention. It is respectfully submitted that, contrary to the contention by the Examiner, Rhein, et al, does not disclose, nor would have suggested, the optical element as in the present claims including molding of the molding material (or film or sheet) which is, or is obtained from, a pseudo cross-link resin composition including at least two specified polymers mixed together, wherein, when the Polymers A and B are copolymers thereof are mixed together, the intermolecular hydrogen bond is formed therebetween; and would have neither taught nor would have suggested the definition of the Polymers A and B, and amounts thereof, as in the present claims.


In view of the foregoing comments and amendments, entry of the present amendments, and reconsideration and allowance of all claims presently pending in the above-identified application, are respectfully requested.

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Respectfully submitted,

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